

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

HOFFMANIA, A NEW SUBGENUS IN *CULICOIDES*
(DIPTERA: CERATOPOGONIDAE)

By IRVING FOX

*Department of Medical Zoology, School of Tropical Medicine
San Juan, Puerto Rico*

There is a group of species in *Culicoides* whose members differ so much from the others in the genus as to be worthy of nomenclatorial recognition, and herein a subgeneric name is provided for it. In the Western Hemisphere 12 species of this new subgenus are known to occur, and a key is given to these species together with the synonymy, distributional notes and comments on diagnostic features.

Culicoides Latreille **Hoffmania**, new subgenus

Female with eyes contiguous in the median line and with the second radial cell of the wing included in a light spot. Male hypopygium as follows: ninth tergite rounded with the apico-lateral processes small or absent; inner process of sidepiece absent; aedagus more or less triangular basally with a ventral marginal band and, distally with a dorsal "peg" having a ball-like tip; harpes approximate or even fused basally. Type.—*Culicoides inamollae* Fox and Hoffman.

Key to the American species of *Hoffmania* n. subg. (females only)

- | | |
|--|----------------------|
| 1. Third palpal segment with a prominent sensory pit or vestiges of one | 5 |
| Third palpal segment without a sensory pit | 2 |
| 2. Legs banded conspicuously; length, 2.00 mm. or more..... | <i>heliconiae</i> |
| Legs uniform light yellowish; length, 1.75 or less..... | 3 |
| 3. Light double spot on vein M ₂ not distinct | <i>oliveri</i> |
| Light double spot on vein M ₂ distinct | 4 |
| 4. Cross vein dark at junction with the media and junction with the radius | <i>maruim</i> |
| Cross vein dark only at junction with the radius..... | <i>trinidadensis</i> |
| 5. A prominent dark spot on cross vein | 6 |
| No prominent dark spot on the cross vein | 10 |
| 6. Two white spots in cell M ₁ beyond the double spot..... | 7 |
| Only one white spot in cell M ₁ beyond the double spot | 8 |
| 7. Mesonotum with a pattern of large dark markings; wing about 1.00 mm. long | <i>diabolicus</i> |
| Mesonotum without a distinct pattern; wing about 1.40 mm. long | <i>guttatus</i> |

8. Mesonotum with three dark bands in the form of an "m" closed in front *insignis*
 Mesonotum without a definite pattern 9
9. Tibiae dark with subbasal light annulations..... *inamollae*
 Tibiae uniform light yellow *painteri*
10. Mesonotum with a median dark triangular spot at the anterior border *venustus*
 Mesonotum without such a spot 11
11. With two light spots in cell M_1 beyond the double spot..... *diabolicus*
 With one light spot in cell M_1 beyond the double spot..... 12
12. Third palpal segment with a distinct circular pit *flavivenula*
 Third palpal segment with the sensory pit not distinctly circular *lutzi*

Culicoides (H.) *heliconiae* Fox & Hoffman

Fig. 1

1942. *Culicoides* species (3) Fox, Puerto Rico Jour. Pub. Health and Trop. Med. 17:418, Figs. 19 and 24. (Venezuela: Maracay)
1944. *Culicoides heliconiae* Fox & Hoffman, Puerto Rico Jour. Pub. Health and Trop. Med. 20:108, Fig. 1.
1945. *Culicoides heliconiae* Vargas, Inst. de Sal. y Enferm. Trop. Rev. 6:43.
1946. *Culicoides heliconiae* Fox, Ent. Soc. Amer. Ann. 39:256.

Records.—Trinidad: Cumuto Village, August 7, 1941 on wall of stable, one female. Honduras: Tela, July, 1924, from a water holding plant, two male pupae.

Remarks.—The female of this species may be recognized by the following features: (1) the absence of a palpal sensory pit, (2) its large size, (3) the banded legs, (4) the mesonotal pattern of large brown markings and (5) the presence of a more or less oval light spot on vein M_1 near the cross vein. The hypopygium is unique in that the harpes are united below the long acuminate ends forming a main body (Fig. 1). A statement in the original description of the adult that the eyes are separated is erroneous, they are contiguous.

Culicoides (H.) *maruim* Lutz

Fig. 3

1913. *Culicoides maruim* Lutz, Inst. Oswaldo Cruz. Mem. 5:48, Pl. 7, Fig. 1; Pl. 8, Fig. 19. (Brazil: Estados Rio de Janeiro e São Paulo. Trinidad.)
1937. *Culicoides maruim* Da Costa Lima, Inst. Oswaldo Cruz Mem. 32: 412.
1945. *Culicoides maruim* Vargas, Inst. Sal. y Enferm. Trop. Rev. 6:43.

Record.—Brazil: Itapagipe, suburb of San Salvador, Bahia, August 16-18, 1933, several males and females collected by N. C. Davis.

Remarks.—In addition to the absence of a palpal sensory pit, two other outstanding characters distinguish this species—the yellowish brown unbanded legs and the absence of a distinct pattern on the mesonotum. The hypopygium is recognizable particularly by the somewhat massive character of the aedagus (Fig. 3).

Culicoides (H.) *trinidadensis* Hoffman

Fig. 4

1925. *Culicoides trinidadensis* Hoffman, Amer. Jour. Hyg. 5:286, Pl. II, Fig. 6 (Trinidad: Port of Spain)
1937. *Culicoides trinidadensis* Macfie, Ann. and Mag. Nat. Hist. 20:9.
1937. *Culicoides trinidadensis* Da Costa Lima, Inst. Oswaldo Cruz Mem. 32:415.
1943. *Culicoides trinidadensis* Johannsen, Ent. Soc. Amer. Ann. 36:780.
1945. *Culicoides trinidadensis* Vargas, Inst. de Sal. y Enferm. Trop. Rev. 6:43.
1946. *Culicoides trinidadensis* Fox, Ent. Soc. Amer. Ann. 39:256 (Trinidad: Stubal's Bay).

Remarks.—The single female specimen upon which the description of this species was based is not available; but it is believed that the material from Stubal's Bay is correctly identified as Hoffman's species. In these specimens the legs, mesonotum, palpi and wings are very similar to those of *maruim*, which Lutz recorded from Trinidad, and indeed little of importance can be found to separate the two species, the character given in the key being admittedly trivial. They are maintained separate, however, because the male of *trinidadensis* has not yet been found and resolution of the problem of identity should await its discovery. Dr. Costa Lima has indicated that *trinidadensis* is a synonym of *insignis* and Dr. Macfie considers it to be a synonym of this species or *guttatus*. These distinguished authors base their opinion on the wings alone; but in both *insignis* and *guttatus* there is a palpal sensory pit and the legs are banded.

Culicoides (H.) *oliveri* Fox and Hoffman

1944. *Culicoides oliveri* Fox and Hoffman, Puerto Rico Jour. Pub. Health and Trop. Med. 20:108, Fig. 5 (Haiti: Mariani and Bayeux).
1945. *Culicoides oliveri* Vargas, Inst. de Sal. y Enferm. Trop. 6:43.
1946. *Culicoides oliveri* Fox, Ent. Soc. Amer. Ann. 39:255, Fig. 4.

Remarks.—The poor condition of the type material does not permit an exact appraisal of this species. Although the palpi are broken off, it is placed near *maruim* in the key because of the wings and legs of the female which are similar to those of that species. The hypopygium according to the allotype, is very close to that of *inamollae*, which leads to the suspicion that the sexes have not been properly matched. The status of this species will remain unsatisfactory until more material is obtained from the type localities.

Culicoides (H.) *guttatus* (Coquillet)

Fig. 2

1904. *Ceratopogon guttatus* Coquillet, N. Y. Ent. Soc. Jour. 12:35 (Brazil: São Paulo).
1913. *Culicoides guttatus* Lutz, Inst. Oswaldo Cruz Mem. 5:58 (Brazil: Rio de Janeiro, Xerém, Bonito).
1932. *Culicoides guttatus* Macfie, Ann. and Mag. Nat. Hist. 10:488 (Colombia)
1935. *Culicoides guttatus* and *Culicoides* (?) *diabolicus* Macfie, Stylops 4:54 (Brazil: Piauí, Tutoia)

1937. *Culicoides guttatus* Macfie, Ann. and Mag. Nat. Hist. 20:8.
 1937. *Culicoides guttatus* Da Costa Lima, Inst. Oswaldo Cruz Mem. 32:415, Fig. 1
 1938. *Culicoides guttatus* Macfie, Roy. Ent. Soc., London Proc. Ser. B., 7:164 (Trinidad: St. Augustine, Noriva Ferry)
 1939. *Culicoides guttatus* Macfie, Rev. de Ent. 10:199 (Brazil: Nova Teutonia)
 1939. *Culicoides guttatus* Adamson, Trop. Agr. (Trinidad) 16:81
 1940. *Culicoides guttatus* Macfie, Roy. Ent. Soc. London Proc. Ser. B., 9:185 (British Guiana: Mazaruni)
 1944. *Culicoides guttatus* Vargas, Inst. de Sal. y Enferm. Trop. Rev. 5:165.
 1945. *Culicoides guttatus* Vargas, Inst. de Sal. y Enferm. Trop. Rev. 6:43.

Records.—Brazil: Porto das Caixas, March 3, 1925, female collected by N. C. Davis; Bahia, Piraya, March 8, 1933, female collected by N. C. Davis. Venezuela: Ocumare, female.

Remarks.—An outstanding character which seems to distinguish this species is the presence of a small isolated dark spot near the tip of vein R_{4+5} . Other features of the female are: (1) the size of the wing—1.47 by .60 mm. in a cotype, (2) a dark spot on the cross vein, (3) two light spots in cell M_1 beyond the double spot, (4) no distinct mesonotal pattern of large dark markings, (4) palpus provided with a sensory pit and with the fourth segment longer than the fifth (Fig. 2) and (6) the banded legs. The hypopygium has not been described, and the characteristics of the female mesonotum are not well known.

Culicoides (H.) *diabolicus* Hoffman

Fig. 5

1925. *Culicoides diabolicus* Hoffman, Amer. Jour. Hyg. 5:294, Pl. I, Fig. 7, Pl. II, Fig. 12, (Pauama: Cabima).
 1932. *Culicoides diabolicus* Macfie, Ann. and Mag. Nat. Hist. 9:487 (Colombia)
 1936. *Culicoides species* Dampf, Medicina (Mexico) 16:228, Fig. 1 (Mexico: Chiapas, El Vergel)
 1937. *Culicoides guttatus* var. *diabolicus* Macfie, Ann. and Mag. Nat. Hist. 20:7 (Trinidad: Nariva River; Montserrat Distr.; St. Augustine)
 1937. *Culicoides diabolicus* Da Costa Lima, Inst. Oswaldo Cruz 32:415, Fig. 5 (Brazil: Pará, Rio Aramakiry Grande).
 1939. *Culicoides diabolicus* Adamson, Trop. Agr. (Trinidad) 16:81 (Trinidad: Caura Valley, Sangre Grande; The Montserrat District)
 1939. *Culicoides flariferus* Hoffman, Puerto Rico Jour. Pub. Health and Trop. Med. 15:172-174, Figs. 1, 2, 3.
 1940. *Culicoides guttatus* (*C. diabolicus* Hoff.) Macfie, Ent. Monthly Mag. 76:25 (British Guiana: New River)
 1943. *Culicoides diabolicus*, *flariferus* Johannsen, Ent. Soc. Amer. Ann. 36:779.
 1944. *Culicoides diabolicus* Vargas, Inst. de Sal. y Enferm. Trop. Rev. 5:163-169, Pl. I, Figs. 3 and 4, Pl. II, Figs. 1-8 (Mexico: Chiapas, Mariscal, Santa Julia y Esperanza).

1945. *Culicoides diabolicus* Vargas, Inst. de Sal y Enferm. Trop. Rev. 6:43.

1946. *Culicoides pseudodiabolicus* Fox, Ent. Soc. Amer. Ann. 39:256, Fig. 1 (Trinidad: Cumuto Village).

Records.—Panama: Canal Zone, Balboa, July 2, 1942, light, No. 1024, two males and three females collected by Dr. P. A. Woke.

Remarks.—This species is similar to *guttatus* but differs particularly in the size of the wing and in the possession of a mesonotal pattern consisting of large dark markings. Certain specimens show a darkening of the cross vein, hence its inclusion in two places in the key; but what are regarded as typical examples have both the cross vein and vein R_{4+5} light. The hypopygium is characterized by the harpes broadly united basally (Fig. 5). Dr. Macfie believes *diabolicus* to be a variety of *guttatus*, but both Dr. Costa Lima and Dr. Vargas separate the two species on the basis of wing size.

Culicoides (H.) *insignis* Lutz

1913. *Culicoides insignis* Lutz, Inst. Oswaldo Cruz Mem. 5:51, Pl. 7, fig. 3 (Brazil: Rio de Janeiro)

1913. *Culicoides guttatus* Lutz, Inst. Oswaldo Cruz Mem. 5:58 (in part), Pl. 7, fig. 7 (not *guttatus* Coq.)

1937. *Culicoides insignis* Da Costa Lima, Inst. Oswaldo Cruz Mem. 32:415, Figs. 2 and 3.

1945. *Culicoides insignis* Vargas, Inst. de Sal. y Enferm. Trop. Rev. 6:43.

Remarks.—The following features distinguish the female of this species: (1) mesonotum with a definite pattern consisting of three dark bands forming an "M" closed in front, (2) the large size, slightly less than 2.00 mm. with wings 1.50 mm. long, (3) the third palpal segment markedly swollen but the sensory pit vestigial consisting of not well defined depressions (see Da Costa Lima's figures), (4) the banded legs, (5) the cross vein with a dark spot and vein R_{4+5} dark to near the tip extending well into the white spot on the second radial cell and (6) only one white spot in cell M: beyond the double spot. The male hypopygium has not been described.

Culicoides (H.) *inamollae* Fox and Hoffman

Fig. 6

1944. *Culicoides inamollae* Fox and Hoffman, Puerto Rico Jour. Pub. Health and Trop. Med. 20:110, Fig. 2 (Puerto Rico: Mayaguez).

1945. *Culicoides inamollae* Vargas, Inst. de Sal y Enferm. Trop. Rev. 6:43.

1946. *Culicoides inamollae* Fox, Ent. Soc. Amer. Ann. 39:257.

Records.—Florida: Collier Co., Immokalee, November 1, 1946, at light, collected by M. S. Whisnant, several males and females received through the courtesy of Capt. D. C. Thurman, U.S.P.H.S.; Miami, 1943-44, two females, at light, received through the courtesy of Capt. Willis Wirth, U.S.P.H.S.

Remarks.—This species is similar to *insignis* in the arrangement of light and dark spots of the wing, the palpus and the legs. It differs, however, in not having the mesonotal design described for that species and in being smaller in size. The total length of *inamollae*, female, is not

more than 1.4 mm. as compared with the "a little less than 2 mm." of *insignis*; the wing in *inamollae* is about 1.1 mm. long while in *insignis* it is 1.5 mm., according to the original description. The hypopygium is characterized by having the harpes separated to their bases and these joined by a peculiar loop (Fig. 6).

Culicoides (H.) *painteri* Fox

Fig. 7

1946. *Culicoides painteri* Fox, Ent. Soc. Amer. Ann. 39:257, Fig. 10 (Honduras: Puerto Castilla)

Remarks.—This species is very close to *inamollae* and may in fact be identical with it. Minor differences in structure as well as the distantly separated type localities urge that the two be maintained apart until more material from Honduras is available. In the specimens at hand the legs are uniform and the palpus and hypopygium show minor differences which, if constant, would permit the retention of this species.

Culicoides (H.) *flavivenula* Lutz

1937. *Culicoides flavivenula* Lutz, Inst. Oswaldo Cruz Mem. 32:418, Fig. 4 (Brazil: Bahia, Japahyba, Angra dos Reis; Rio de Janeiro, Manguihos).

1945. *Culicoides flavivenula* Vargas, Inst. de Sal. y Enferm. Trop. Rev. 6:43

Remarks.—This species is similar to *insignis* from which it differs in not having a dark spot on the cross vein and not having vein R_{4+5} dark to near the tip as well as in the structure of the palpus, which is illustrated in the original description. The male has not been described.

Culicoides (H.) *lutzi* Da Costa Lima

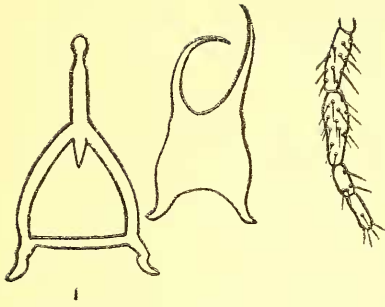
1937. *Culicoides lutzi* Da Costa Lima, Inst. Oswaldo Cruz Mem. 32:419, Fig. 5 (Brazil: Para, Abaete).

1945. *Culicoides lutzi* Vargas, Inst. de Sal. y Enferm. Trop. Rev. 6:43.

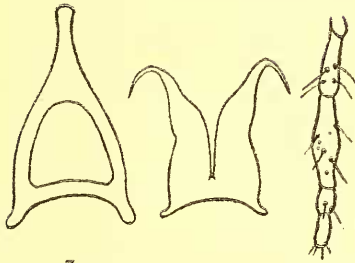
Remarks.—This species is similar to *flavivenula* Lutz from which it

Explanation of Plate I

- Fig. 1. *Culicoides* (H.) *heliconiae* Fox and Hoffman, aedagus, harpes and female palpus.
 Fig. 2. *Culicoides* (H.) *guttatus* (Coq.) female palpus.
 Fig. 3. *Culicoides* (H.) *marum* Lutz, aedagus, harpes and female palpus.
 Fig. 4. *Culicoides* (H.) *trinidadensis* Hoffman, female palpus.
 Fig. 5. *Culicoides* (H.) *diabolicus* Hoffman, aedagus, harpes and female palpus.
 Fig. 6. *Culicoides* (H.) *inamollae* Fox and Hoffman, aedagus, harpes and female palpus.
 Fig. 7. *Culicoides* (H.) *painteri* Fox, aedagus, harpes and female palpus.
 Fig. 8. *Culicoides* (H.) *venustus* Hoffman, aedagus, harpes and female palpus.



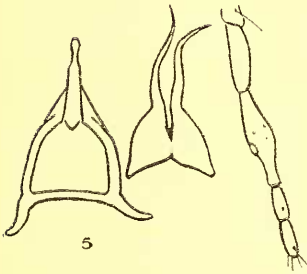
2



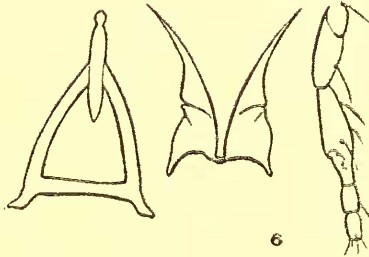
3



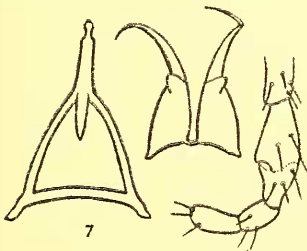
4



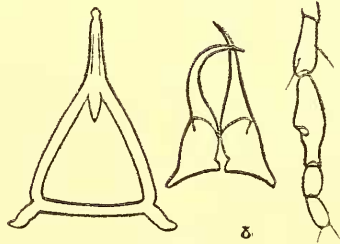
5



6



7



8

differs in the mesonotal pattern and in the structure of the palpus, illustrated in the original description. The male has not been described.

Culicoides (H.) *venustus* Hoffman

Fig. 8

1925. *Culicoides venustus* Hoffman, Amer. Jour. Hyg. 5:290, Pl. I, Fig. 4, Pl. II, Fig. 9 (Maryland: Baltimore)
1937. *Culicoides venustus* Root and Hoffman, Amer. Journ. Hyg. 25:155, Pl. I, Fig. 2 (New York, Connecticut: East Haddam).
1943. *Culicoides venustus* Johannsen, Ent. Soc. Amer. Ann. 36:780.
1945. *Culicoides venustus* Vargas, Inst. de Sal. y Enferm. Trop. Rev. 6:43.

Remarks.—The female of this species is characterized by the following distinctive features: (1) the large size—1.9 mm. long with a wing length of 1.5 mm. (2) the third palpal segment slightly swollen with a not particularly prominent sensory pit (3) the distinctive mesonotal pattern as described and illustrated by Hoffman and (4) the banded legs. There may be two light spots near the tip of cell M₁ beyond the double spot or only one. The hypopygium (Fig. 8) is unique in that the harpes although approximate are not united as in all the other species treated in this paper.